



USGS NSF GRIP, GSP Opportunity

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- USGS Center:** New England Water Science Center
- Project Title:** Opening the black box -- digging into watershed dissolved organic carbon (DOC) processes to interpret DOC dynamics at the outlet
- Summary:** As a leading team in stream sensor application, we welcome a GRIP intern to help expand our focus on DOC quality. The intern will have free experimental reign in an established research watershed with great opportunities to publish. This position is set in a beautiful small town /rural setting with plenty of outdoor recreational activities.
- Project Hypothesis or Objectives:** The Sleepers River Research Watershed in Vermont is one of five sites of the USGS Water, Energy, and Biogeochemical Budgets (WEBB) program. A longstanding goal of the program is to understand the processes driving the movement and transformations of dissolved organic matter from the terrestrial landscape through the stream network. A sensor at the outlet of the small forested W-9 watershed measures fluorescence, a proxy for DOC, every 15 minutes. While the sensor provides a detailed record of how DOC changes with hydrology, we can only infer the actual sources and processes on the landscape. The main objective of this internship is to “open up the black box” of the watershed to determine DOC sources and the processes controlling DOC movement within the watershed. An example approach would be to construct detailed transects from hillslope to stream channel, measure how DOC concentration and DOC quality change with transect position and soil depth along the transect, and how these changes relate to the in-stream sensor at the stream gage.
- Duration:** Up to 12 months
- Internship Location:** Montpelier, VT
- Field(s) of Study:** Chemistry, Geoscience, Life Science

Applicable NSF Division: EAR Earth Sciences

Intern Type Preference: Either Type of Intern

Keywords:
watershed
dissolved organic matter
dissolved organic carbon
optical sensors
hydrology
biogeochemistry

Expected Outcome: The WEBB program is part of the USGS Climate and Land Use Change Mission Area, and research on the carbon cycle is one of our main themes. The “niche” of WEBB in carbon cycle research is the role of the terrestrial landscape and its headwater streams in mobilizing DOC. We expect the GRIP intern to enhance our understanding of these terrestrial processes, and thereby provide tools to better interpret the DOC signal at the watershed outlet. For example, what causes hysteresis in the DOC-discharge relation? Better understanding of these terrestrial processes and their seasonal shifts will help the WEBB program to project how changing climate will impact the carbon cycle.

Special skills/training Required: Basic experience with spreadsheets, statistical packages, and databases. Hydrologic and biogeochemical background and interest. Laboratory and field experience desirable.

Duties/Responsibilities: This internship is designed to advance our knowledge of dominant sources and mechanisms of DOC release from a forested watershed. The GRIP intern will review past work on DOC at Sleepers River and explore unpublished data in our database for context in designing a field and laboratory research campaign. In consultation with the mentor, he or she will design field experiments to understand the sources and mechanisms of DOC movement in subsurface waters during hydrologic events, and its timing relative to DOC dynamics in the stream. A key tool to assess DOC dynamics will be DOC quality, potentially including spectral slope, fluorescence excitation – emission matrices (EEMs), fluorescence index (FI), humification index (HI). For these laboratory determinations we will use ongoing collaborations with USGS – Boulder and/or University of Vermont. We expect the GRIP intern to present results at scientific meetings, and to lead and/or co-author peer-reviewed publications on this research.
